This invention relates t concret forms.

In known concrete structures, forms are used to hold poured c ncrete in place until cured. Thes forms are made of wood, fiberglass or steel and have to be removed after curing, which leaves a non-insulated wall and insulation must then be applied. Some form blocks which are now in use establish a poor permanent insulation. In addition such form blocks cannot be used for high rise structures as it is not possible to place horizontal reinforcing steel in the blocks and thus horizontal beams cannot be provided over the entire length or width of a given structure. Other disadvantages include poor dimensional stability and high per unit weight.

An object of this invention is to provide a building unit so constructed as to facilitate its prefabrication by machine and hence greatly reduce its cost.

Another object is to provide building units, which are concrete forms as well as permanent insulation and which may be readily utilized by relatively unskilled labor in erecting a wall, partition or the like.

Another object is to provide through the use of the present building unit a wall or partition or the like which does not require the use of facing material such as plaster, bricks or stucco, thus eliminating the high cost of plasterers, bricklayers, carpenters of drying plaster and costly cleaning.

According to this invention, a concrete form includes two spaced transverse walls extending from one longitudinal wall to the other to form a rigid structure defining a bore between said walls, said walls being of foamed ~~polystyrene~~ polymeric material, and at least one pair of corresponding edges of said transverse walls being inwardly spaced from adjacent edges of longitudinal walls so as to provide a longitudinal beam of concrete integral with a column of concrete in said bore when concrete is poured into a plurality of assembled forms.

In the drawings which show preferred embodiments of the invention :

Figure 1 is a perspective view of three building units in accordanc with this inv ntion,

Figur 2 is a t p plan view of a c rner unit,



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Fig. 3 is a sectional end elevational view of a wall incorporating building units in accordance with this invention,

Fig. 4 is a sectional view taken along the line 4-4 of Fig. 3.

The permanent insulating form unit 10, according to Fig. 1, comprises two longitudinal walls 11 and two transverse end walls 12 and partition walls 13 within the unit 10 which divide the space formed by the longitudinal and transverse walls 11 and 12 into six compartments 14. Transverse walls 12 and partition walls 13 are recessed on top and bottom at 15 to form beams 19 (Fig. 3) through the entire wall of a given structure. Recesses 16 in transverse walls 12 and partition walls 13 shown in Fig. 1 are provided to hold horizontal steel reinforcing rods 17 (Figs. 3 and 4) in place without tying. The units 10 are made from foamed plastic such as polystyrene and are placed in layers and bonded with a water and frost resistant binding material on all joints to prevent penetration of air and water. The superposed permanent insulating form units 10 when filled with reinforced concrete 18 by hand or machine, create a reinforced concrete wall with insulation on two sides. The recesses 15 in the two transverse walls 12 and in the partition walls 13 are located on top and bottom of the unit 10 which enables the unit 10 to be reversed.

As shown in Fig. 1 the building unit 10 is preferably provided with interior and exterior side panels 26 and 27 respectively secured thereto as by adhesive or the like. The interior wall surface 26 may be gypsum wall board for example and the exterior wall 27 may be impregnated fiber board. These panels provide extra strength as well as providing a surface for painting or plastering. If gypsum board is used the joints between panels may be taped in the conventional manner.

It will be noted that the side panels 26 and 27 are offset with respect to the wall of the building unit so as to provide an overlap with adjacent building units, thus facilitating aligning of the building units. The units 10 may be provided with a finish coat of stucco, thin veneer brick 28, conventional brick 29 or any suitable weather resistant decorative material, as shown in Fig. 3.

It will also be appreciated that the building units 10 may be fabricated in various sizes including floor to ceiling panels for use in homes or other

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small r structures.

In Fig. 2 a corner unit 50 is shown for use in conjunction with th wall unit 10. The corner unit 50 includes spaced apart side walls 51 and 52, end walls 53 and 54 and partition walls 55. The partition walls 55 have the same vertical dimensions as the partition walls 13 described abov and are provided with recesses 16 to receive the horizontally extending reinforcing steel 17. Panels 58, 59, 60 and 61 of gypsum board, fiber board or the like are provided on the side walls 51 and 52 in the same manner as the panels 26 and 27 described with reference to Fig. 1.

It will be appreciated that although the wall form unit 10 is described and illustrated as having interior and exterior side panels 26 and 27 secured thereto, the form unit 10 can be prefabricated without the side panels. However if no side panels 26 and 27 of gypsum board or the like are provided on the form unit 10, the edges of the longitudinal walls should be adhesively secured to the mating edges of adjacent wall form units to prevent seepage of the liquid concrete. Whereas in the case of the form unit 10, gluing is not essential.

SUPPLEMENTARY DISCLOSURE

It has now been found that the ability of th form to withstand th hydrostatic pressure may be improved by providing a molded form having substantially cylindrical cores.

In the accompanying drawings:

Fig. 5 is a perspective view of a modified building unit similar to Fig. 1,

Fig. 6 and Figs. 6a and 6b are top plan views of molded building units or blocks in accordance with this invention for use in building walls,

Fig. 7 is a perspective view of the building unit of Fig. 6,

Fig. 8 is a sectional view of a wall structure made from building units of Fig. 6,

Fig. 9 is a section taken along the line 9-9 of Fig. 8,

Fig. 10 is a form similar to that of Fig. 7 for use in building walls, and

Fig. 11 is a fragmentary end view showing the tongue and groove joint provided between two forms of the type shown in Fig. 10.

The use of expanded beads of polystyrene or expanded polystyrene foam provides a number of advantages. These advantages include its light-weight and good dimensional stability under varying temperature and moisture conditions. The expanded polystyrene is also capable of being formed to very close tolerances required to provide smooth interior and exterior walls. A further advantage is that of being resilient to provide waterproof joints between adjacent wall building units. The weight of the form causes the horizontal joints to seal due to the resiliency of the foamed plastic.

The use of plasterboard as the interior side panel form 26 of the wall form 10 also provides important advantages. The plasterboard is inexpensive, fire resistant and possesses the necessary rigidity to withstand the hydrostatic pressure of the uncured concrete. It has been found in actual practice that concrete can be poured to a height of several feet without damaging the wall form.

Th advantages of a 1 ft in place form which not only provides insulation but als pr vides s mi-finished r finished interi r and exterior

surfaces are quite obvious. Briefly, the use of removable forms is all but eliminated thus resulting in a great saving in labour as well as saving transportation costs for moving forms to and from the site and the cost of cl aning and storing forms. Furthermore as insulation and plasterboard are prefabricated preferably by machine before being moved to the site, there are savings in labour required to install these materials and little or no labour is required to clean up the building site after the forms are in place. Ordinarily a certain amount of cleaning up time would be required after installation of each of the two materials.

Furthermore although the plasterboard increases the weight of the form, a certain amount of weight is desirable to hold the form in place until the concrete is poured. It has also been found that the exterior panels may be formed of asbestos board to improve the fire resistance of the form.

Alternatively as shown in Fig. 5 an insulating form unit 50 is constructed with the two transverse end walls 12 spaced from the end edges of the longitudinal walls 11, a distance equal to half the distance between the partitions 13.

It will be apparent that when units 50 are placed end to end as illustrated in Fig. 5, a cavity 51 is provided between adjacent end walls 12 which when filled with concrete provides a vertical column.

In Fig. 6 and 7 a modified concrete form 70 for use in wall structures is shown. The form 70 is molded of expanded polystyrene beads and comprises two longitudinal walls 71 and 72 and two integral transverse end walls 73 and 74. Integral partition walls 75 define four substantially cylindrical bores or channels 76 extending through the form 70. The shape of each bore 76 is such that four planar surfaces are interconnected at their ends by arcuate surfaces, thereby increasing the strength of the form without greatly decreasing the load bearing cross section. A substantially semi-circular indentation 77 in each of the end walls 73 and 74 and the partition walls 75 provides a longitudinally extending channel 78 interconnecting the bores 76. As shown more clearly in Fig. 9 the channel 78 also interconnects the bores of adjacent similar f rm units 70.

The b res 76 due to th ir substantially cylindrical configuration,

improve th ability of the form to withstand the hydrostatic pressure of the w t concrct . The surface ar a of th junction betw en th side walls 71 and 72 and the partition walls 75 is increased thereby improving the strength of the form. It will be not d that the bores 76 are tapered t facilitate rel asing the form 70 from a mold. This taper also serves to keep the form from floating up when it is filled with liquid concrete.

Forms 70a and 70b, shown in Figs. 6a and 6b, have bores 76a and 76b of elliptical or circular cross-section. In other respects the forms 70a and 70b are identical to the form 70 and need not be described in detail.

A wall constructed of building units 70 is shown in Figs. 8 and 9 and comprises a preassembled panel 80 of units 70 secured together by larger sheets of building material 82 and 83 secured to the outer surfaces of the side walls 71 and 72. The panel 82 is material adapted for exterior use such as wood siding and the panel 83 is preferably plaster or plasterboard. In the embodiment shown a wire mesh 85 or the like is secured to the outer faces of the units 70 and plaster is applied to the wire mesh before the concrete is poured.

Reinforcing steel rods 86 extending vertically and horizontally within the bores 76 and channels 78 respectively to provide additional strength are conveniently spot welded together during assembly of the panel 80.

It has been found that the strength of the form 70 is greatly increased by moulding the expanded polystyrene as opposed to cutting with conventional tools and securing pieces so cut with adhesive. The reason for the increased strength is that the skin is formed at the surface of the beads which increases the tensile strength by approximately 35%.

Alternatively a concrete form for use in constructing walls indicated generally at 150 in Figs. 10 and 11 is similar to the form 70 of Fig. 6. The form 150 is molded of expanded polystyrene beads and comprises two longitudinal walls 151 and 152 and two integral transverse end walls 153 and 154. Three integral partition walls 155 and the end walls 153 and 154 define four substantially cylindrical bores or channels 156 identical to the bore 76 d scrib d with ref r nce to Fig. 6. An arcuate indentation in each of the end walls 153 and 154 and the partition walls 155 pr vid s a longitudinally extending

channel 158 interconnecting the bores 156.

Similarly the underside of the form 150 is provided with a longitudinally extending channel 158a of semi-circular cross section whereby in use a horizontally extending concrete beam is formed in the space provided by the associated channels 158 and 158a of two forms 150 when one form is placed on top of the other.

It will be noted that the top, bottom and end edges of the wall 151 and 152 are provided with tongues 160 or groove 161 to mate with grooves and tongues of adjacent similar forms 150. The tongues and grooves have a taper of about 5° to provide a more water tight joint.

The walls 153, 154 and 155 are provided with recesses 165 similar to the recesses 16 described with reference to Fig. 1 to hold horizontal reinforcing steel in place without tying. The recess 165 taper inwardly so that the portion 166 of the wall supporting the steel has a very small surface area. This is an advantage because the reinforcing rod will thus be more completely enveloped in concrete.

Polystyrene forms also reduce fire hazard and provide a fire resistant structure.

The embodiments of the invention in which an x-clusive property or privil ge is claimed are defined as follows:

1. A concrete form including two spac d longitudinal walls and two spaced transverse walls extending from one longitudinal wall to the other and bonded thereto to form a rigid structure defining a hole between said walls, said walls being of foamed polymeric material, and at least one pair of corresponding edges of said transverse walls being inwardly spaced from adjacent edges of longitudinal walls so as to provide a longitudinal beam of concrete integral with columns of concrete in said hole and adjacent similar holes when concrete is poured into a plurality of assembled forms.

2. A concrete from according to claim 1 wherein said corresponding edges of said transverse walls have longitudinally extending grooves in which longitudinally extending reinforcing rods can be located so as to extend between said transverse walls.

3. A concrete form as claimed in claim 1 wherein rigid outer panel members are secured to said form prior to filling said form with concrete to provide finished or semi-finished surfaces for said wall.

4. A concrete form as claimed in claims 1, 2 or 3 wherein projections are provided on edges of said longitudinal walls and recesses are provided in opposed edges of said longitudinal walls whereby projections and recesses of superimposed similar forms co-operate to position said forms and minimize seepage of liquid concrete.

Claims Supported by the Suppl mentary Disclosure

5. A concrete form including two spac d longitudinal walls and two spac d transverse walls extending from one longitudinal wall to another to form a rigid structure defining a bore between said walls, said walls being integrally molded of foamed polymeric material, and at least one pair of corresponding edges of said transverse walls being inwardly spaced from adjacent edges of the longitudinal walls so as to provide a longitudinal beam of concrete integral with a column of concrete in said bore when concrete is poured into a plurality of assembled forms.

6. A concrete form including two spaced longitudinal walls and two spaced transverse walls extending from one longitudinal wall to the other to form a rigid structure defining a bore between said walls, said walls being integrally molded of foamed polymeric material and at least one pair of corresponding edges of said transverse walls being inwardly curved so as to provide a longitudinal beam of at least partly curved cross-section integral with a column of concrete in said bore when concrete is poured into a plurality of assembled forms.

7. A concrete form including two spaced longitudinal walls and two spaced transverse walls extending from one longitudinal wall to the other to form a rigid structure defining a bore between said walls, said walls being integrally molded of foamed polymeric material, at least one pair of corresponding edges of said transverse walls being inwardly spaced from adjacent edges of the longitudinal walls so as to provide a longitudinal beam of concrete integral with a column of concrete in said bore when concrete is poured into a plurality of assembled forms, and said walls being shaped to provide said bore with a curved cross-section.

8. A concrete form according to claim 7 wherein said bore is tapered.

9. A concrete form according to claims 5, 6 or 7 wherein said polymeric material is polystyrene.

10. A concrete form according to claims 5, 6 or 7 wherein said polymeric material is expanded beads of polystyrene.

11. A concrete form according to claim 8 wherein said polymeric material is expanded beads of polystyrene.

12. A concrete form including two spaced longitudinal walls and two spaced transverse walls extending from one longitudinal wall to the other to form a rigid structure defining a bore between said walls, said walls being integrally molded of foamed polystyrene, at least one pair of corresponding edges of said transverse walls being inwardly curved so as to provide a longitudinal beam of at least partly curved cross-section integral with a column of concrete in said bore when concrete is poured into a plurality of assembled forms, and said walls being shaped to provide said bore with a curved cross-section.

13. A concrete form according to claim 5 or 6 wherein tongues and grooves are provided on the edges of said side walls for mating with grooves and tongues respectively on edges of the side walls of adjacent similar forms arranged to provide a wall structure.

14. A concrete form as claimed in claim 12 wherein said bore is vertical when said form is in use and tapers toward a smaller cross-secti n adjac nt its lower end and tongues are provided along upper edges of said longitudinal walls and grooves are provided in lower edges of said longitudinal walls whereby grooves of superimposed similar forms are adapted to receive and sealingly engage the tongues of underlying forms.

15. A concrete form as claimed in claim 14 wherein said longitudinal walls terminate adjacent said transverse walls and tongues are provided on one end of said form and grooves are provided on an opposed end of said form to align said forms vertically and provide sealing engagement between adjacent similar forms.

16. A concrete form as claimed in claims 14 or 15 wherein said transverse walls provide end walls for said form and at least one partition wall is provided intermediate said end walls defining two or more vertical holes, at least one edge of said partition wall being inwardly spaced from adjacent edges of said longitudinal walls to provide said longitudinal beam of concrete and each said end wall having a minimum thickness less than the minimum thickness of said partition wall to facilitate alignment of said vertical holes when said forms are assembled in superimposed relationship in a wall.



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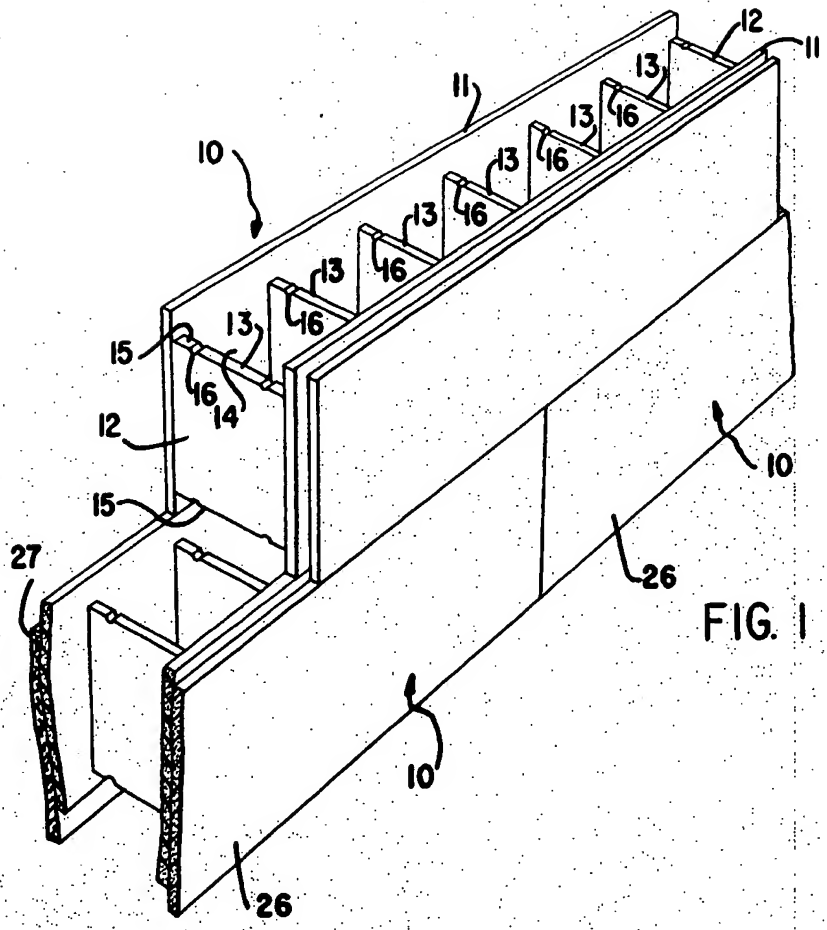


FIG. 1

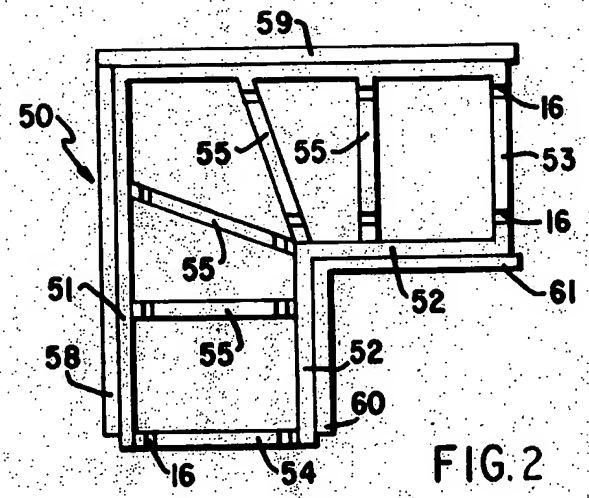


FIG. 2

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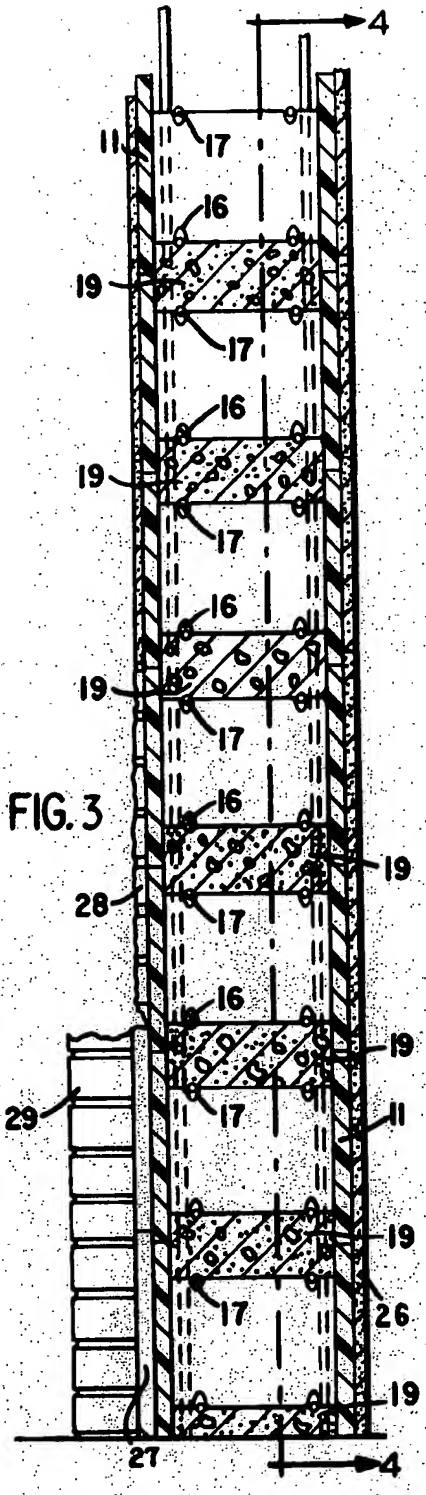


FIG. 3

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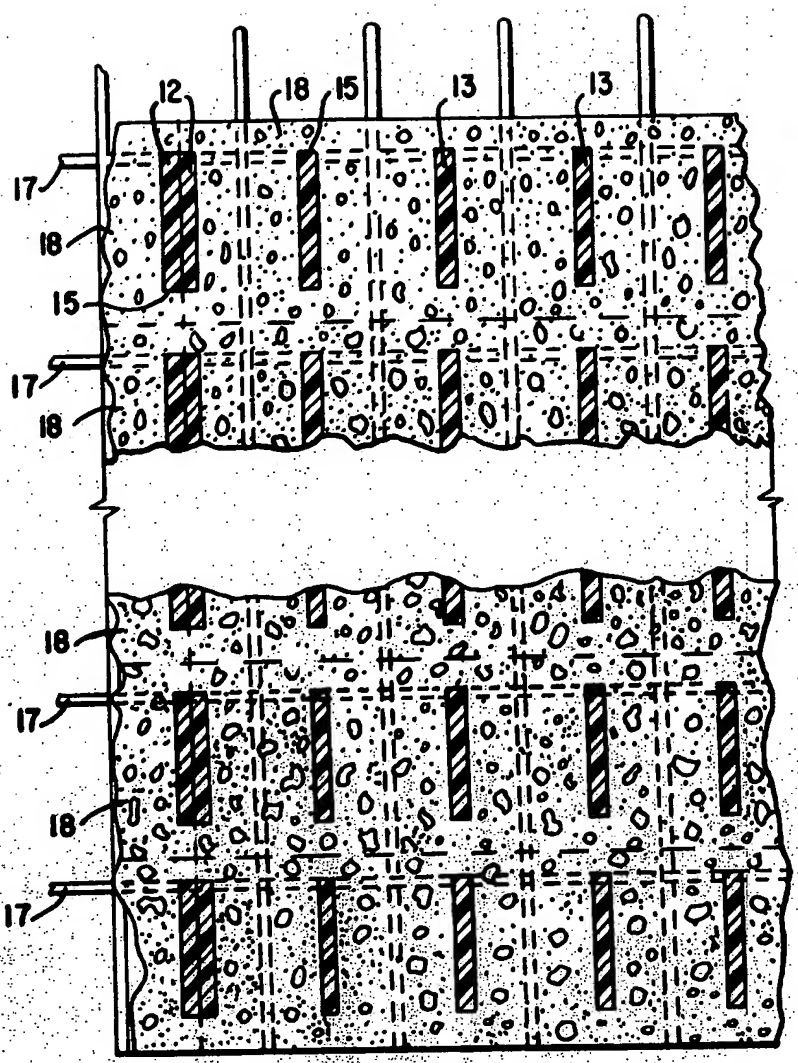


FIG.4

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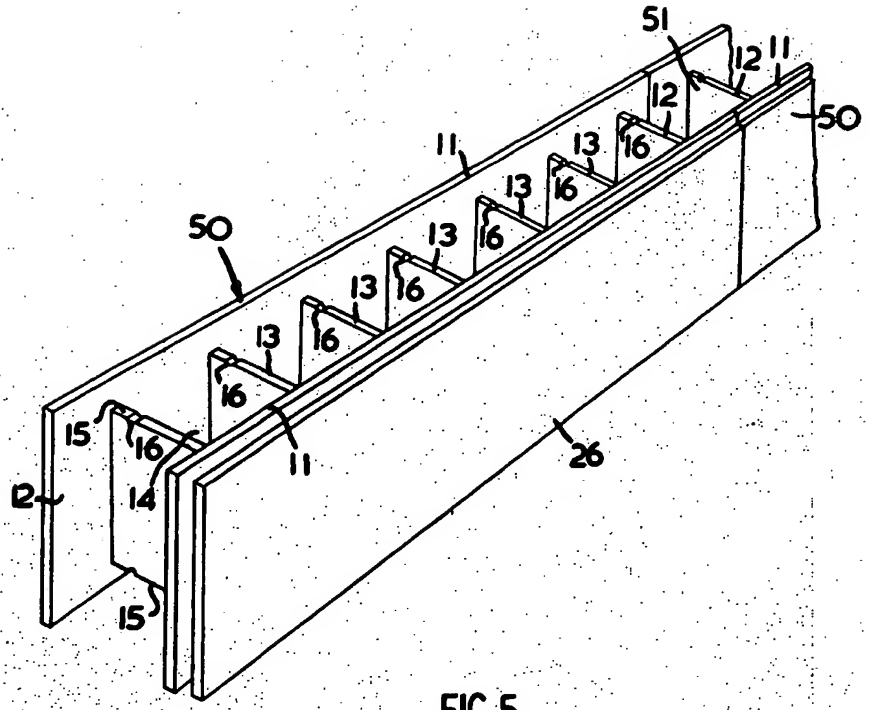


FIG. 5

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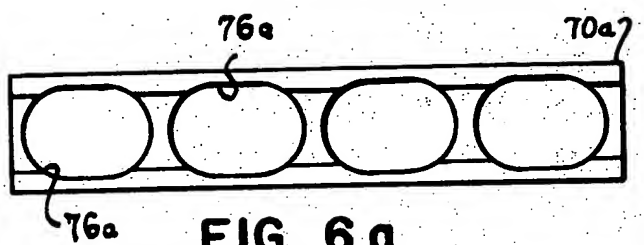


FIG. 6a

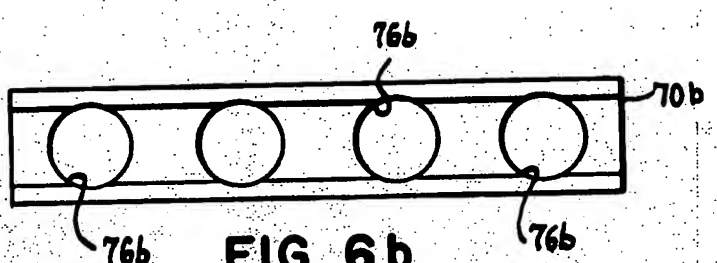


FIG. 6b

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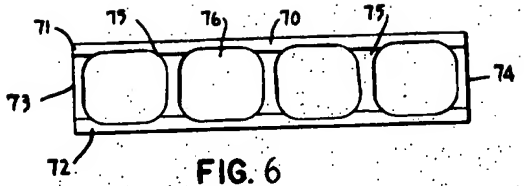


FIG. 6

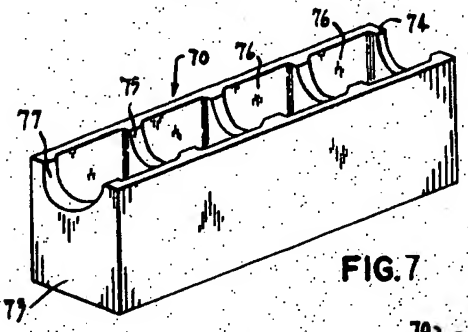


FIG. 7

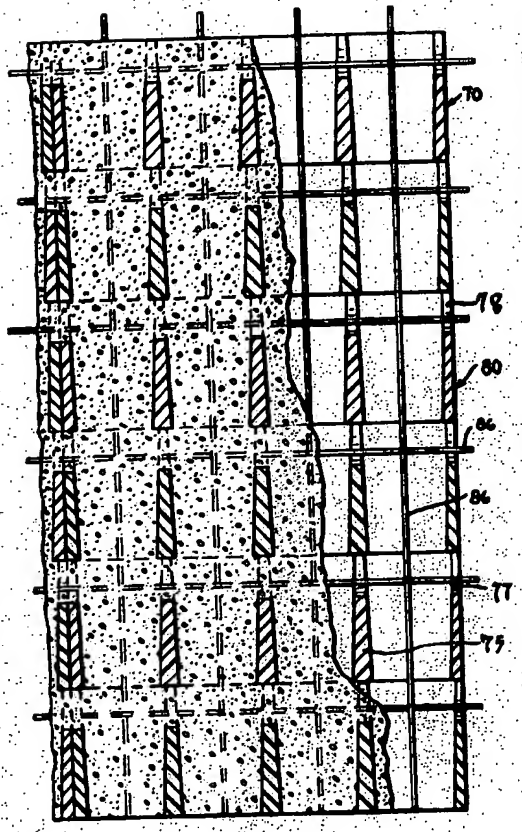


FIG. 9

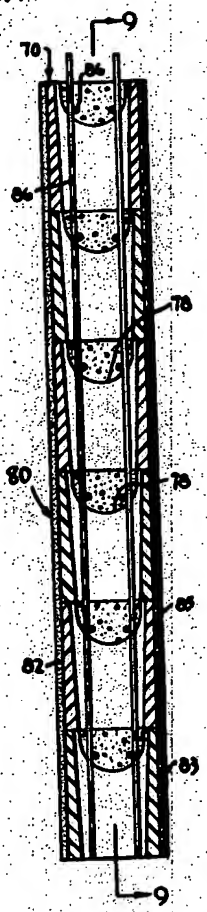


FIG. 8

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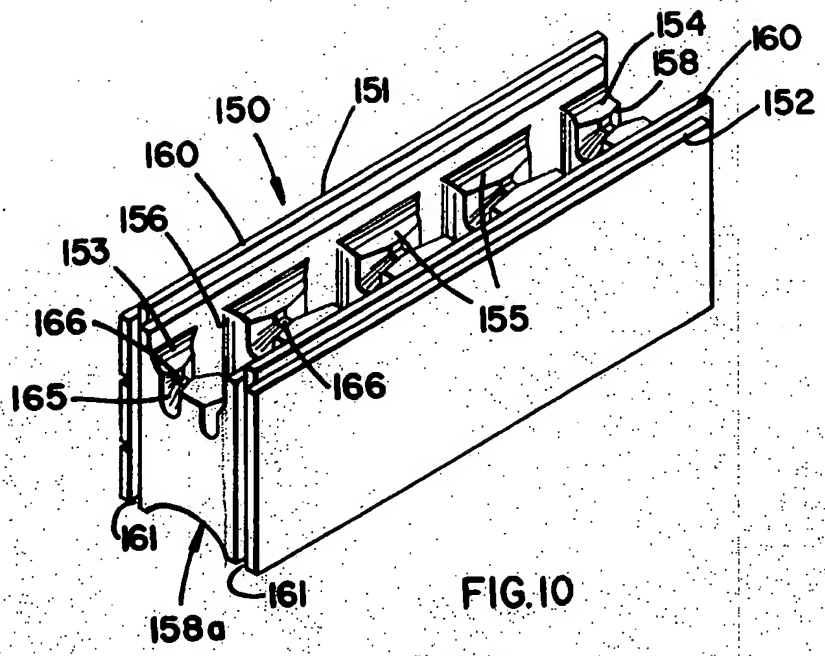


FIG. 10

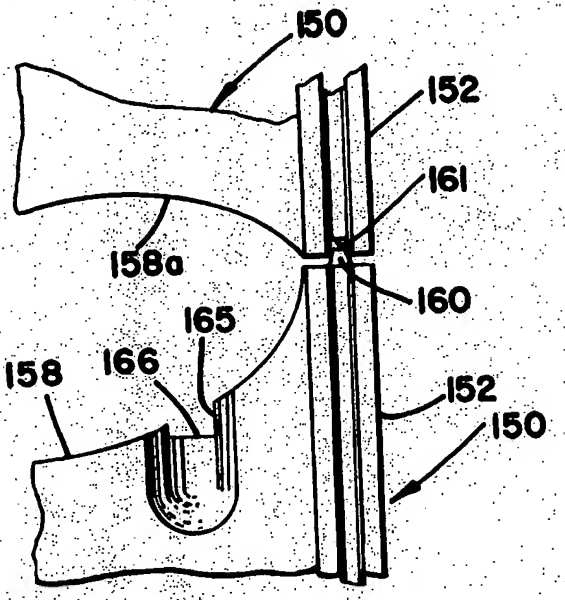


FIG. 11

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